

What is claimed is:

1. Use of at least one metal complex of formula (1)

$$5 \quad [L_n M e_m X_p]^z Y_q \quad (1),$$

wherein

Me is manganese; titanium; iron; cobalt; nickel or copper;

X is a coordinating or bridging radical,

10 n and m are each independently of the other an integer having a value of from 1 to 8,

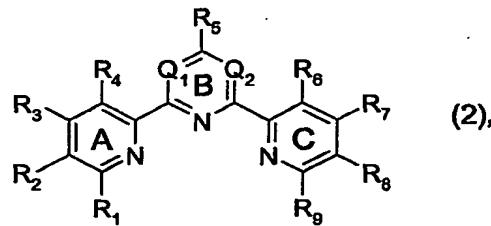
p is an integer having a value of from 0 to 32,

z is the charge of the metal complex,

Y is a counter-ion,

$q = z/(\text{charge of } Y)$, and

15 L is a ligand of formula (2)



wherein

Q₁ is N or CR₁₀,

Q_2 is N or CR_{11} ,

20 $R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}$ and R_{11} are each independently of the others hydrogen; unsubstituted or substituted C_1 - C_{18} alkyl or unsubstituted or substituted aryl; cyano; halogen; nitro; $-COOR_{12}$ or $-SO_3R_{12}$ wherein

R₁₂ is in each case hydrogen, a cation or unsubstituted or substituted C₁-C₁₈alkyl or unsubstituted or substituted aryl;

25 -SR₁₃; -SO₂R₁₃ or -OR₁₃ wherein

R_{13} is in each case hydrogen or unsubstituted or substituted C_1 - C_{18} alkyl or unsubstituted or substituted aryl;

$-\text{NR}_{14}\text{R}_{15}$; $-(\text{C}_1\text{-C}_6\text{alkylene})\text{-NR}_{14}\text{R}_{15}$; $-\text{N}^\oplus\text{R}_{14}\text{R}_{15}\text{R}_{16}$; $-(\text{C}_1\text{-C}_6\text{alkylene})\text{-N}^\oplus\text{R}_{14}\text{R}_{15}\text{R}_{16}$;
 $-\text{N}^\ominus(\text{R}_{13})\text{-}(\text{C}_1\text{-C}_6\text{alkylene})\text{-NR}_{14}\text{R}_{15}$; $-\text{N}^\ominus(\text{C}_1\text{-C}_6\text{alkylene})\text{-NR}_{14}\text{R}_{15}]_2$;

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$-N(R_{13})-(C_1-C_6\text{alkylene})-N^{\oplus}R_{14}R_{15}R_{16}$; $-N[(C_1-C_8\text{alkylene})-N^{\oplus}R_{14}R_{15}R_{16}]_2$; $-N(R_{13})-N-R_{14}R_{15}$ or
 $-N(R_{13})-N^{\oplus}R_{14}R_{15}R_{16}$, wherein

R_{13} is as defined above and

R_{14} , R_{15} and R_{16} are each independently of the other(s) hydrogen or unsubstituted or

5 substituted $C_1-C_{18}\text{alkyl}$ or unsubstituted or substituted aryl, or

R_{14} and R_{15} , together with the nitrogen atom linking them, form an unsubstituted or substituted 5-, 6- or 7-membered ring which may contain further hetero atoms, as catalysts for oxidation reactions with organic peroxy acids and/or precursors of organic peroxy acids and H_2O_2 and or a precursor of H_2O_2 .

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2. Use according to claim 1, wherein Me is manganese, which is in oxidation state II, III, IV or V.

3. Use according to either claim 1 or claim 2, wherein

15 X is CH_3CN , H_2O , F^- , Cl^- , Br^- , HOO^- , O_2^{2-} , O^{2-} , $R_{17}COO^-$, $R_{17}O^-$, $LMeO^-$ or $LMeOO^-$, wherein R_{17} is hydrogen or unsubstituted or substituted $C_1-C_{18}\text{alkyl}$ or aryl, and L and Me are as defined in claim 1.

4. Use according to any one of claims 1 to 3, wherein

20 Y is $R_{17}COO^-$, ClO_4^- , BF_4^- , PF_6^- , $R_{17}SO_3^-$, $R_{17}SO_4^-$, SO_4^{2-} , NO_3^- , F^- , Cl^- , Br^- or I^- , wherein R_{17} is hydrogen or unsubstituted or substituted $C_1-C_{18}\text{alkyl}$ or aryl.

5. Use according to any one of claims 1 to 4, wherein

n is an integer having a value of from 1 to 4, especially 1 or 2.

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6. Use according to any one of claims 1 to 5, wherein

m is an integer having a value of 1 or 2, especially 1.

7. Use according to any one of claims 1 to 6, wherein

30 p is an integer having a value of from 0 to 4, especially 2.

8. Use according to any one of claims 1 to 7, wherein

z is an integer having a value of from 8- to 8+.

9. Use according to claim 1 to 8, wherein

R_5 is C_1 - C_{12} alkyl; phenyl unsubstituted or substituted by C_1 - C_4 alkyl, C_1 - C_4 alkoxy, halogen, cyano, nitro, carboxy, sulfo, hydroxy, amino, N-mono- or N,N-di- C_1 - C_4 alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, N-phenylamino,

5 N -naphthylamino, phenyl, phenoxy or by naphthoxy; cyano; halogen; nitro; $-COOR_{12}$ or $-SO_3R_{12}$

wherein R_{12} is in each case hydrogen, a cation, C_1 - C_{12} alkyl, unsubstituted phenyl or phenyl substituted as indicated above; $-SR_{13}$, $-SO_2R_{13}$ or $-OR_{13}$

wherein R_{13} is in each case hydrogen, C_1 - C_{12} alkyl, unsubstituted phenyl or phenyl substituted as indicated above;

10 $-N(R_{13})-NR_{14}R_{15}$

wherein R_{13} is as defined above and R_{14} and R_{15} are each independently of the other hydrogen, unsubstituted or hydroxy-substituted C_1 - C_{12} alkyl, unsubstituted phenyl or phenyl substituted as indicated above,

15 or R_{14} and R_{15} , together with the nitrogen atom linking them, form an unsubstituted or C_1 - C_4 alkyl-substituted pyrrolidine, piperidine, piperazine, morpholine or azepane ring; $-NR_{14}R_{15}$ or $-N^{\oplus}R_{14}R_{15}R_{16}$ wherein R_{14} , R_{15} and R_{16} are each independently of the other(s) hydrogen, unsubstituted or hydroxy-substituted C_1 - C_{12} alkyl, unsubstituted phenyl or phenyl substituted as indicated above,

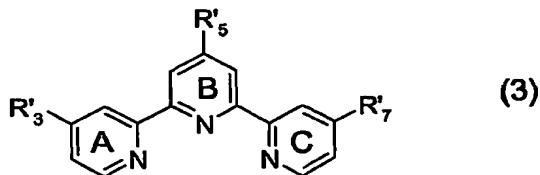
20 or R_{14} and R_{15} , together with the nitrogen atom linking them, form an unsubstituted or C_1 - C_4 alkyl-substituted pyrrolidine, piperidine, piperazine, morpholine or azepane ring; N -mono- or N,N-di- C_1 - C_4 alkyl- $N^{\oplus}R_{14}R_{15}R_{16}$ unsubstituted or substituted by hydroxy in the alkyl moiety,

wherein R_{14} , R_{15} and R_{16} are each independently of the others hydrogen, unsubstituted or hydroxy-substituted C_1 - C_{12} alkyl, unsubstituted phenyl or phenyl substituted as indicated above,

25 or R_{14} and R_{15} , together with the nitrogen atom linking them, form a pyrrolidine, piperidine, piperazine, morpholine or azepane ring which is unsubstituted or substituted by at least one C_1 - C_4 alkyl or by at least one unsubstituted C_1 - C_4 alkoy and/or

30 substituted C_1 - C_4 alkyl, wherein the nitrogen atom may be quaternised; N -mono- or N,N-di- C_1 - C_4 alkyl- $NR_{14}R_{15}$ unsubstituted or substituted by hydroxy in the alkyl moiety, wherein R_{14} and R_{15} may have any one of the above meanings.

10. Use according to claim 1 to 9, wherein L have the following formula (3)



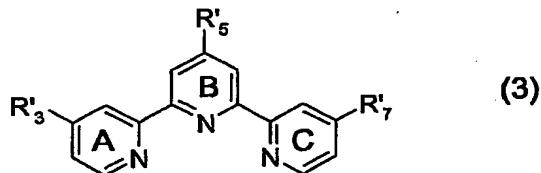
wherein

R₃' and R₇' are independently from each other hydrogen; C₁-C₄alkoxy; hydroxy; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, wherein

5 the nitrogen atoms, especially the nitrogen atoms that are not bonded to one of the rings A, B and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised,

10 R₅' is C₁-C₄alkoxy; hydroxy; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, wherein the nitrogen atoms, especially the nitrogen atoms that are not bonded to one of the rings A, B and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised.

15 11. Use according to claim 1 to 10, wherein L have the following formula (3)



wherein

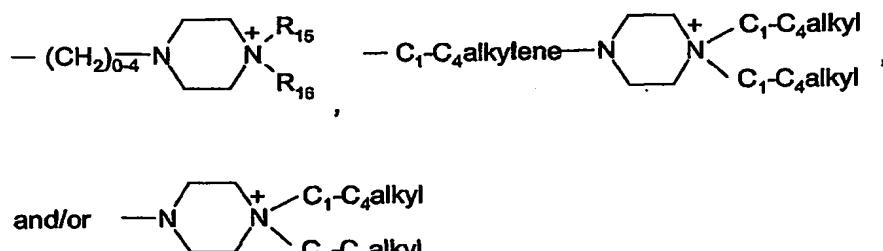
R₃' and R₇' are independently from each other hydrogen; C₁-C₄alkoxy; hydroxy; N-mono- or

20 N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, wherein the nitrogen atoms, especially the nitrogen atoms that are not bonded to one of the rings A, B and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised,

25 R₅' is C₁-C₄alkoxy; hydroxy; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, wherein the nitrogen atoms, especially the nitrogen atoms that

are not bonded to one of the rings A, B and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised,
with the proviso that

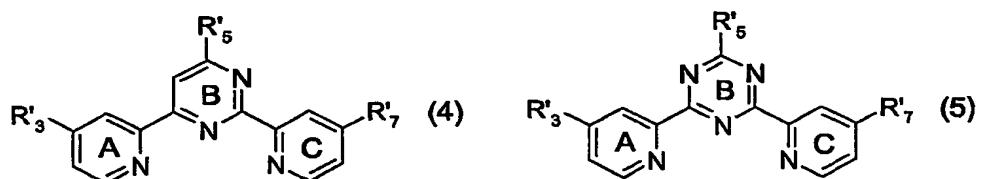
5 (i) at least one of the substituents R'₃, R'₅ and R'₇ is one of the radicals



wherein R₁₅ and R₁₆ are independently from each other hydrogen or unsubstituted or substituted C₁-C₁₈alkyl or unsubstituted or substituted aryl and

10 wherein the unbranched or branched alkylene group may be unsubstituted or substituted, and wherein the C₁-C₄alkyl groups, which are branched or unbranched independently of one another, may be unsubstituted or substituted and wherein the piperazine ring may be unsubstituted or substituted.

15 12. Use according to claim 1 to 9, wherein L have the following formula (4) and/or (5)



wherein

R'₅ is C₁-C₄alkoxy; Cl; hydroxy; phenyl; phenyl substituted by OC₁-C₂alkyl, OH or C₁-C₄alkyl; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety; or -NR₁₄R₁₅; -(C₁-C₆alkylene)-NR₁₄R₁₅; -N(R₁₃)-(C₁-C₆alkylene)-NR₁₄R₁₅; -N[(C₁-C₆alkylene)-NR₁₄R₁₅]₂; or -N(R₁₃)-N-R₁₄R₁₅, wherein

R₁₃ is hydrogen; C₁-C₁₂alkyl or unsubstituted phenyl or phenyl substituted by (substituted in the alkyl moiety by hydroxy) N-mono- or

N,N-di-C₁-C₄alkylamino-, N-phenylamino-, N-naphthylamino-, phenyl-, phenoxy- or naphthoxy, and

R₁₄ and R₁₅ are each independently of the other hydrogen, unsubstituted or hydroxy-substituted C₁-C₁₂alkyl, unsubstituted phenyl or phenyl substituted as indicated above, or

R₁₄ and R₁₅, together with the nitrogen atom linking them, form a pyrrolidine, piperidine, piperazine, morpholine or azepane ring that is unsubstituted or substituted by at least one unsubstituted C₁-C₄alkyl and/or substituted C₁-C₄alkyl, especially a pyrrolidine, piperidine, piperazine, morpholine or azepane ring, and

R'₃ and R'₇ are each independently of the other hydrogen; C₁-C₄alkoxy; Cl; hydroxy; phenyl; phenyl substituted by OC₁-C₂alkyl, OH or C₁-C₄alkyl; N-mono- or N,N-di-C₁-C₄alkylamino substituted by hydroxy in the alkyl moiety; or -NR₁₄R₁₅; -(C₁-C₆alkylene)-NR₁₄R₁₅; -N(R₁₃)-(C₁-C₆alkylene)-NR₁₄R₁₅; -N[(C₁-C₆alkylene)-NR₁₄R₁₅]₂; or -N(R₁₃)-N-R₁₄R₁₅, wherein

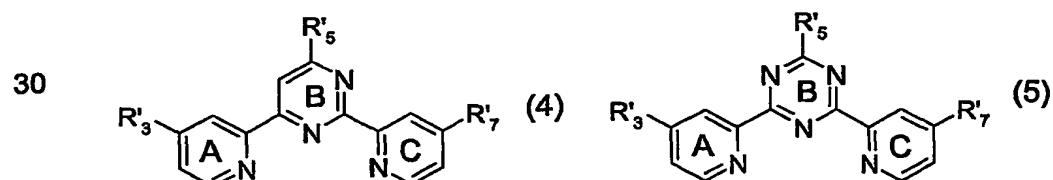
R₁₃ is hydrogen; C₁-C₁₂alkyl or unsubstituted phenyl or phenyl substituted by (substituted in the alkyl moiety by hydroxy) N-mono- or N,N-di-C₁-C₄alkylamino-, N-phenylamino-, N-naphthylamino-, phenyl-, phenoxy- or naphthoxy, and

R₁₄ and R₁₅ are each independently of the other hydrogen; unsubstituted or hydroxy-substituted C₁-C₁₂alkyl, unsubstituted phenyl or phenyl substituted as indicated above, or

R₁₄ and R₁₅, together with the nitrogen atom linking them, form a pyrrolidine, piperidine, piperazine, morpholine or azepane ring that is unsubstituted or substituted by at least one unsubstituted C₁-C₄alkyl and/or substituted C₁-C₄alkyl, especially a pyrrolidine, piperidine, piperazine, morpholine or azepane ring.

R₁₄ and R₁₅, together with the nitrogen atom linking them, form a pyrrolidine, piperidine, piperazine, morpholine or azepane ring that is unsubstituted or substituted by at least one unsubstituted C₁-C₄alkyl and/or substituted C₁-C₄alkyl, especially a pyrrolidine, piperidine, piperazine, morpholine or azepane ring.

13. Use according to claim 1 to 9, wherein L have the following formula (4) and/or (5)



wherein R'₃ and R'₇ are independently from each other hydrogen; C₁-C₄alkoxy; Cl; hydroxy; phenyl; phenyl substituted by OC₁-C₂alkyl, OH or C₁-C₄alkyl; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl moiety, wherein the nitrogen atoms, especially the nitrogen atoms that are not bonded to one of the rings A, B

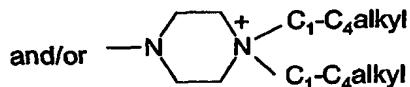
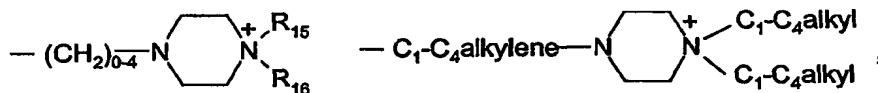
5 and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised,

R'₅ is C₁-C₄alkoxy; Cl; hydroxy; phenyl; phenyl substituted by OC₁-C₂alkyl, OH or C₁-C₄alkyl; N-mono- or N,N-di-C₁-C₄alkylamino unsubstituted or substituted by hydroxy in the alkyl

10 moiety, wherein the nitrogen atoms, especially the nitrogen atoms that are not bonded to one of the rings A, B and/or C, may be quaternised; or a pyrrolidine, piperidine, piperazine, morpholine or azepane ring unsubstituted or substituted by at least one C₁-C₄alkyl, wherein the amino groups may be quaternised,

with the proviso that

15 (i) at least one of the substituents R'₃, R'₅ and R'₇ is one of the radicals



wherein R₁₅ and R₁₆ are independently from each other hydrogen or unsubstituted or substituted C₁-C₁₈alkyl or unsubstituted or substituted aryl and

20 wherein the unbranched or branched alkylene group may be unsubstituted or substituted, and wherein the C₁-C₄alkyl groups, which are branched or unbranched independently of one another, may be unsubstituted or substituted and wherein the piperazine ring may be unsubstituted or substituted.

25 14. Use according to any of the preceding claims wherein at least one mono- or poly-peroxy acid having at least 1 to 20 carbon atoms in the alkyl chain and/or its corresponding precursor and H₂O₂ is used.

15. Use according to any of the preceding claims wherein at least one

organic peroxy acids of formula $\text{R}_{18}\overset{\text{O}}{\underset{\parallel}{\text{C}}}\text{-O-OM}$,

wherein

M signifies hydrogen or a cation,

R_{18} signifies unsubstituted $\text{C}_1\text{-C}_{18}$ alkyl; substituted $\text{C}_1\text{-C}_{18}$ alkyl; unsubstituted aryl; substituted

5 aryl; $-(\text{C}_1\text{-C}_6\text{alkylene})\text{-aryl}$, wherein the alkylene and/or the alkyl group may be substituted; and phthalimido $\text{C}_1\text{-C}_8$ alkylene, wherein the phthalimido and/or the alkylene group may be substituted is used.

16. Use according to any of the preceding claims,

10 wherein CH_3COOOH or ϵ -phthalimido peroxy hexanoic acid or a alkali salt thereof is used.

17. Use according to any of the preceding claims,

wherein TAED and/or NOBS as precursors of peroxy acids and sodium percarbonate and/or sodium perborate are used.

15 **18. Use according to any one of claims 1 to 17 for the bleaching of stains or of soiling on textile material, or for the prevention of redeposition of migrating dyes, or for the cleaning of hard surfaces.**

20 **19. Use according to any one of claims 1 to 17, wherein the metal complex compounds of formula (1) are used as catalysts for reactions using peroxy acids or their precursors for bleaching in the context of paper making.**

25 **20. Use according to any one of claims 1 to 17, wherein the metal complex compounds of formula (1) are used in detergent, cleaning, disinfecting or bleaching compositions.**

21. Use according to any one of claims 1 to 17, wherein the metal complex compounds of formula (1) are used in automatic dishwasher formulations.

30 **22. Use according to claim 20, wherein the metal complex compounds of formula (1) are formed *in situ* in the detergent, cleaning, disinfecting or bleaching composition.**

23. A detergent, cleaning, disinfecting or bleaching composition containing

- I) from 0 to 50 wt-%, preferably from 0 to 30 wt-%, A) of at least one anionic surfactant and/or B) of a non-ionic surfactant,
- II) from 0 to 70 wt-%, preferably from 0 to 50 wt-%, C) of at least one builder substance,
- III) 1 - 99 wt-%, preferably 1 - 50 wt-%, D) of at least one peroxy acid and/or at least one precursors of peroxy acid, the latter in combination with hydrogen peroxide and/or a precursor of hydrogen peroxide as defined in claims 14, 15, 16 and 17,

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- IV) E) at least one metal complex compound of formula (1) as defined in claims 1 – 13 in an amount that, in the liquor, gives a concentration of from 0.5 to 100 mg/litre of liquor, preferably from 1 to 50 mg/litre of liquor, when from 0.5 to 20 g/litre of the detergent, 10 cleaning, disinfecting or bleaching agent are added to the liquor, and
- V) water ad 100 wt-%,

wherein the percentages are in each case percentages by weight, based on the total weight of the composition.

15 **24. A solid formulation containing**

- a) from 1 to 99 wt-%, preferably from 1 to 40 wt-%, especially from 1 to 30 wt-%, of at least one metal complex compound of formula (1) as defined in claim 1 - 13 and at least one organic peroxy acid and/or at least one precursor of an organic peroxy acid and H₂O₂ as defined in claims 14, 15, 16 and 17,
- b) from 1 to 99 wt-%, preferably from 10 to 99 wt-%, especially from 20 to 80 wt-%, of at least one binder,
- c) from 0 to 20 wt-%, especially from 1 to 20 wt-%, of at least one encapsulating material,
- d) from 0 to 20 wt-% of at least one further additive and
- e) from 0 to 20 wt-% water.

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25. A solid formulation according to claim 24, which is in the form of granules.